## Geotechnical Services Quality Management Program

Geotechnical Services (GS) strives to produce quality products for the Department and the contractors who rely on them to construct quality projects at the lowest cost. A quality geotechnical product will have little rework, be easy to review, be cost effective and buildable, and will be easy to administer during construction.

The ***Geotechnical Services Quality Management Program*** (QMP) is a strategy for learning and continuous improvement. It applies to project deliverables and project work processes at the project level, the office level and system-wide. The result of the QMP is to yield effective delivery, stewardship and service with processes that are efficient and effective in meeting the goals of the Department. Building an effective learning organization requires focus in several areas, including participation of all involved, open communication, commitment to excellence and trust.

Quality is ensured through Quality Control (QC), Quality Assurance (QA) and Independent Quality Assurance (IQA). Quality Control consists of the processes, practices and activities performed at the project team level. Quality Assurance is the internal verification that Quality Control has occurred at the office level. Independent Quality Assurance is external to the project delivery process and evaluates implementation of Quality Control and Quality Assurance. IQA collects and evaluates system level data, identifies trends and makes recommendations for process improvements.

The QMP begins with the receipt of the work request and continues through the final recommendations and construction completion. Completion of the QMP provides assurance to the geoprofessional, GS Management, our clients, and the FHWA that the product delivered to the client conforms to the established procedures and standards, has undergone the appropriate reviews and quality checks, and meets the project expectations.

This document provides a framework for GS to develop clear, consistent practices for providing Quality Control, Quality Assurance, and Independent Quality Assurance of the various products we produce for the Department. It is expected that the geotechnical functional units listed below will develop individual *Quality Management Plans* that are consistent with the methodology, terms, definitions, and roles and responsibilities of this document.

- Geotechnical Design
- Geotechnical Drilling
- Foundation Testing
- Geotechnical Instrumentation

- Geophysics
- Laboratory Testing
- Engineering Graphics
- Scour

## Terms and Definitions

### Project Quality

Project Quality is a composite of Technical Quality, Cost Effectiveness, Meeting Schedule and Delivery, and Stakeholder Expectations.

| | |
|---|---|
| **Technical Quality:** | Compliance with Departmental Policies, Processes and Procedures |
| **Cost Effectiveness:** | Perform efficient investigations, provide appropriate recommendations, and stay within budget |
| **Meet Schedule and Delivery:** | Meet agreed schedule commitments |
| **Expectations:** | Delivery of products that meet client's needs |

### Quality Control (QC)

The processes, practices and activities performed at the project team level, during the project delivery process. Quality control activities monitor and verify that project deliverables meet defined quality standards.

### Quality Assurance (QA)

The monitoring and verification that all Quality Controls are completed during the project delivery process that provide confidence that the project team has followed the established Project Specific Quality Control Plan. Quality assurance activities occur at the office level.

### Independent Quality Assurance (IQA)

IQA consists of sampling products for compliance with standards. IQA monitors processes across all offices at a system level, helps identify process improvement strategies, and evaluates the effectiveness of those strategies, once implemented. IQA should provide the data which guides the process improvements at the system level.

### Project Specific Quality Control Plan (PSQC Plan)

The project specific plan, developed and managed by the geotechnical design team, that assures quality for each component of the work.

### Functional Quality Control Plan (FQC Plan)

Each functional unit's specific plan that provide the basis for Functional Quality Assurance.

**Quality Control Elements (QCEs)**
The individual procedures and processes that the geotechnical design team or functional unit define in their PSQC Plan to ensure quality in the product.

## Introduction

The GS QMP must be applied to programmed work efforts. Special cases, such as storm damage or other emergency response may necessitate modification to the program in order to meet required deadlines. Even in these special cases, however, effort must be made to apply as much of the QMP as feasible.

The GS QMP recognizes that the majority of the products developed by GS are produced with the Geotechnical Design Office as the lead unit, with various functional units contributing components relative to their specialty (Drilling Services, Geophysics, Geotechnical Laboratory, etc). The program is also valid for those products where Geophysics, Geotechnical Laboratory, Foundation Testing or Geotechnical Instrumentation is the lead unit and provides the Geoprofessional of Record.

Geotechnical *Project Quality* includes the elements of *Technical Quality, Cost Effectiveness, Meeting Schedule and Delivery,* and *Stakeholder Expectations*. *Technical Quality* is provided throughout the geotechnical project development process by the geoprofessional in responsible charge of the project. The preparation of the various products produced by GS in accordance with the QMP assures management that appropriate quality checks have been completed, and all documents and supporting data have been thoroughly reviewed. The effort of all members of the geotechnical design team in fulfilling their roles and responsibilities through participation and communication is critical to the success of *Project Quality*.

*Schedule/Delivery* and *Stakeholder Expectations* are identified at the time the work is requested and reviewed at subsequent GS and/or PDT meetings, as the project scope is refined. Estimates of investigation scope and delivery schedule are updated as better project information becomes available and reported to the client as appropriate. GS Management is assured that *Cost Effectiveness*, *Schedule/Delivery* and *Stakeholder Expectations* are being met through regularly scheduled status meetings with their branch chiefs.

## Methodology

The geotechnical design offices are responsible for developing their project-specific work plans and associated Project Specific Quality Control Plans (PSQC Plans). The PSQC

Plan should identify the tasks required for product delivery, the associated QCEs, and should be revised as required throughout the life of the project.

Similarly, the geotechnical functional units (Drilling, Geophysics, Foundation Testing, etc.) are responsible for the quality of their products. Their Functional Quality Control Plans (FQC Plans) include the associated Quality Control Elements (QCEs) that provide the foundation for Functional Quality Assurance (FQA). The functional units will provide documentation that their product was prepared in accordance with their individual quality control procedures. GS Functional Quality Control Plans are attached as Appendices A through G.

Project quality assurance is the responsibility of the Office Chief and is provided at two stages in the project development process: the planning phase and the design phase. By preparing the associated products in accordance with the PSQC Plan, management is assured that appropriate quality checks occurred, and that the products and supporting data were adequately reviewed.

## Roles and Responsibilities

A variety of GS personnel with differing specialties and experience may contribute to the development of the geotechnical product. The effort of all members in fulfilling their roles and responsibilities through participation and communication is critical to the project's success. Each member of the geotechnical team is committed to accomplish the work with the quality promised in a timely and cost effective manner. Each member of the geotechnical team is accountable for meeting his or her commitments.

### Geoprofessional

The geoprofessional performs day-to-day geotechnical and/or geologic project work. If the geoprofessional is a licensed Civil Engineer or Geologist then they are in responsible charge of the geotechnical project. If the geoprofessional is unlicensed then either the Branch Chief or other licensed professional is in responsible charge of the geotechnical project. The geoprofessional may perform the work independently, or may provide work assignments and technical direction to other geotechnical staff (licensed or unlicensed), as well as requesting support from functional units. The geoprofessional is responsible for:

- Working within his/her area of competence or under the direction of a competent geoprofessional
- Adhering to all Departmental policies, procedures, and standards of practice
- Providing the relevant and accurate project information to the functional units, and integrating the functional unit product into the overall project
- Complying with all aspects of the QMP

**Branch Chief**

The branch chief is ultimately responsible for the quality of the project and is also the Task Manager of various Work Breakdown Structure (WBS) activities. The branch chief:

- Supervises the geoprofessional and other geotechnical design staff assigned to the project
- Assures that the geoprofessional assigned to the project has the required technical knowledge and experience for the work assigned
- Tracks the progress of the project and the technical decisions made
- Has a working knowledge of the project site and its geotechnical conditions such that he/she can provide effective oversight of the geoprofessional's work
- Reviews the project investigation and design at various milestone points
- Assures the quality of information being sent to functional units or clients
- Approves all aspects of the project as developed by the geoprofessional including the investigation, design (including exceptions), recommendations, and the final report or product
- Assures that the project complies with the GS QMP

**Functional Specialist**

The Functional Specialist develops that unit's product for the geoprofessional in support of the overall project. They understand how their specific product fits into the overall project, and are responsible for the quality of their individual product. Functional Specialists within GS include personnel in drilling, geophysics, foundation testing, geotechnical instrumentation, scour, engineering graphics, geotechnical laboratory, and administration.

**Functional Manager**

The Functional Manager supervises the Functional Specialist as well as other functional unit staff assigned to the project. They assure the quality of the product delivered to the geoprofessional.

**Office Chief**

The Office Chief is responsible for producing the results that were intended, meeting delivery requirements, staying within budget and keeping the clients and stakeholders satisfied. The Office Chief retains these responsibilities over the entire life of the project, and is the primary point of contact for the project's geotechnical needs. The Office Chief exercises an active role in coordinating with the geotechnical team members to assist with the development of overall project quality, including development and maintenance of the Office's QC/QA program. The Office Chief is responsible for quality assurance and must approve any deviations from the QMP relating to emergency response.

### Geotechnical Services Management

Support from the Deputy Division Chief and the Geotechnical Services Management Team (GSMT) is critical to the successful implementation of the GS QMP. This support includes:

- Timely decisions on unresolved issues elevated by the geotechnical design team
- Dedicating adequate resources to develop and maintain standards
- Providing sufficient staffing levels for QMP implementation on all projects
- Providing adequate training and tools for staff
- Providing feedback on the QM process

## Independent Quality Assurance

In order to measure the effectiveness of the GS QMP, Independent Quality Assurance will be performed at a system level. Specific IQA tasks will be identified by the GSMT and will be assigned to teams or individuals who will develop the instructions that will include when, how and who will do the IQA. The instructions will be submitted to the GSMT for approval. The goal of the IQA process is to ensure that the GS QMP is being followed and to provide a mechanism to improve staff skills by evaluating geotechnical products and providing system level feedback. IQA will be used to identify the need for GS-wide training, to recommend the development of tools, and to recommend new or modified processes and standards. Results and observations from IQA will periodically be reported to GS Management along with recommendations for training and/or modification of standards.

## Appendices

| | |
|---|---|
| Appendix A | Geotechnical Design Functional Quality Control Plan |
| Appendix B | Drilling Services Functional Quality Control Plan |
| Appendix C | Foundation Testing Functional Quality Control Plan |
| Appendix D | Geotechnical Instrumentation Functional Quality Control Plan |
| Appendix E | Geophysics Functional Quality Control Plan |
| Appendix F | Geotechnical Laboratory Functional Quality Control Plan |
| Appendix G | Engineering Graphics Functional Quality Control Plan |
| Appendix H | Scour Functional Quality Control Plan |
| Appendix I | Independent Quality Assurance Program (under development) |

## Quality Management Plan for Geotechnical Design

This *Quality Management Plan* documents the procedures required to assure compliance with the GS Quality Management Program. The four Geotechnical Design Offices are the primary points of contact for most GS clients and are responsible for providing geotechnical and geologic recommendations to support the Department's mission. Geotechnical recommendations are usually conveyed to the client via a Geotechnical Design Report or Foundation Report and may include Logs of Test Borings or Boring Records.

GS provides recommendations to its clients during the preliminary phases of a project (both the PID Component and PA&ED Component) and the design phase (PS&E Component) of project development. Preliminary geotechnical recommendations are usually based on existing information and field visits, whereas design geotechnical recommendations expand on preliminary recommendations and include additional information obtained from drilling, geophysics and/or laboratory testing. This *Quality Management Plan* documents the required quality control and quality assurance (QC/QA) activities used by the geotechnical design team to assure that quality products are delivered to our clients.

It is expected that geotechnical design staff read, understand, execute, and implement their respective roles and responsibilities of the *GS Quality Management Program* and this *Quality Management Plan*.

### Overview

Documentation of QC/QA activities will utilize either the *GS Project Specific Quality Control Plan for Preliminary Geotechnical Report Deliverables* or the *GS Project Specific Quality Control Plan for Geotechnical Design Report Deliverables* as appropriate for the deliverable being prepared. The PSQC Plan presents a list of activities requiring oversight and documentation to assure that the project is progressing appropriately and meeting all standards. Note that the PSQC Plan lists only a subset of the many work activities that may be performed by the geoprofessional on a given deliverable.

The PSQC Plan allows the geotechnical design team to identify roles and expectations specific to their project and to establish and track completion of the identified quality milestones. For all of the listed activities it is expected that the Branch Chief provide the appropriate level of supervision and/or oversight required to comply with the GS QMP and this *Quality Management Plan*.

The following lists are activities that are to be performed for the GS QC/QA effort; bulleted items within each activity are commentary and/or suggestions of things to do for each item to provide guidance of what is intended for each QC/QA item:

**Preliminary Geotechnical Report Quality Activities:**

Review Request with Client

- Speak with the client to assure full understanding of the work request and to identify potential omissions in the scope of work requested
- Discuss schedule and agree to a delivery date

Develop Work Plan

- Identify activities, personnel, schedule and priorities
- Identify and coordinate with other geotechnical work on the same project

Review of Archive Data

- Review relevant as-built plans, LOTB and reports by searching BIRIS and the Geotechnical Archive (GeoDOG), and any other relevant records.

Field Visit

- Assure that the appropriate observations are made in accordance with the project needs

Evaluate Alternatives and Provide Recommendations

- Identify alternatives including associated advantages, disadvantages, and risks
- Provide recommended alternative

Peer Review of Recommendations (Optional)

- Discuss project and proposed recommendations alternatives with at least one experienced colleague other than the Branch Chief

Review Draft Report

- Check for compliance with applicable reporting standard
- Check for consistency with other reports, if any, for the same project
- Seismic specialist to review the seismic section and related recommendations
- Check for implementation of informal peer review recommendations
- Check resource estimates for design investigation and construction phase
- Check for readability, clarity, grammar, and spelling.

Third Party Review of Draft Final Report

- Someone other than the Geoprofessional or Branch Chief review the report for reading comprehension, English grammar, spelling and clarity. This is not a technical review of the report.

Issue Planning Report

- Geoprofessional and Branch Chief initial the PSQC Plan and forward it to the Office Chief
- Office Chief reviews the PSQC Plan, resolves any outstanding issues, and initials the PSQC Plan once it is complete
- Archive PSQC.

**Geotechnical Design Report Quality Activities:**

Review Request with Client

- Speak with the client to assure full understanding of the work request and to identify potential omissions in the scope of work requested
- Discuss schedule and agree to a delivery date

Develop Work Plan

- Identify activities, personnel, schedule and priorities
- Identify and coordinate with other geotechnical work on the same project

Review of Archive Data

- Review relevant as-built plans, LOTB and reports by searching BIRIS and the Geotechnical Archive (GeoDOG), and any other relevant records.

Field Visit

- Assure that the appropriate observations are made in accordance with the project needs

Field Investigation Peer Review

- Follow the requirements of the *GS Field Investigation Peer Review* procedure

Design and Constructability Peer Review

- Follow the requirements of the *GS Design and Constructability Peer Review* procedure

Calculation Check

- Calculations are checked by another geoprofessional to the extent necessary that the checker, geoprofessional and Branch Chief are confident that they are correct.

Review Draft Report

- Check for compliance with applicable reporting standard
- Check for consistency with other reports, if any, for the same project
- Seismic specialist to review the seismic section and related recommendations
- Check for implementation of informal peer review recommendations
- Check resource estimates for design investigation and construction phase
- Check for readability, clarity, grammar, and spelling

Third Party Review of Draft Final Report

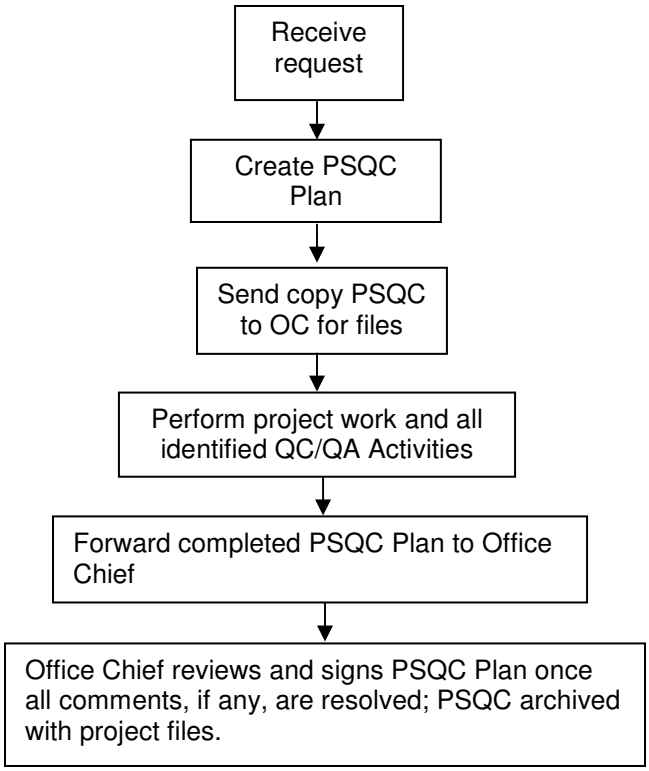
- Someone other than the Geoprofessional or Branch Chief review the report for reading comprehension, grammar, spelling and clarity. This is not a technical review of the report.

Issue Geotechnical Report

- Geoprofessional and Branch Chief initial the PSQC Plan and forward it to the Office Chief
- Office Chief reviews the PSQC Plan, resolves any outstanding issues, and initials the PSQC Plan once it is complete
- Archive PSQC

**Methodology**

After receipt and review of a client request, the first order of work will be to create the appropriate PSQC Plan by marking the planned QC/QA activities with an "X" and unnecessary tasks with an "N/A". The filled out PSQC plan is provided to the Office Chief to establish a baseline plan and can be used for the review of the completed PSQC. As the quality checks are completed the Geoprofessional and Branch Chief will date and initial. When the product is complete, the Geoprofessional and Branch Chief will initial next to their names in the PSQC Plan header and the completed PQSC Plan and draft final product will be delivered to the Office Chief. The Office Chief will review the documents and will initial next to his/her name in the header to certify that the PSQC Plan was completed correctly and that the deliverable quality checks were met. The completed PSQC is archived with the project files. The following flowchart presents the *Quality Management Plan* process for Geotechnical Design.



# Project Specific Quality Control Plan for Preliminary Geotechnical Report Deliverables

Use this form for preparation of preliminary geotechnical reports, such as SPGR's, PFR's and/or DPGR's. Refer to the *Quality Management Plan for Geotechnical Design* for directions on the usage of this form and for the minimum expectations for quality control for each of the QC/QA activities.

Date: _____ Initial Plan: ☐

Addendum: ☐ _____

## Project Information

District: _____ County: _____ Route: _____ PM: _____

EA: _____ Project ID: _____

Report Type (Circle One): SPGR PFR DPGR

Project Common Name: _____

Geoprofessional: _____ PSQC Complete: _____

Branch Chief: _____ PSQC Complete: _____

Office Chief: _____ PSQC Complete: _____

## QC/QA Activities

| | Geoprofessional | | Branch Chief | | |
|---|---|---|---|---|---|
| | **Planned** | **Completed** | **Planned** | **Completed** | |
| Review Request with Client | | | | | |
| Develop Work Plan | | | | | |
| Review of Archive Data | | | | | |
| Field Visit | | | | | |
| Evaluate Alternatives and Recommendations | | | | | |
| Peer Review of Recommendations (Optional) | | | | | ☐ Helpful ☐ Not Helpful |
| Review Draft Report | | | | | |
| 3rd party Draft Final Report Review | | | | | |
| Issue Preliminary Geotechnical Report | | | | | |
| | | | | | |
| | | | | | |

X: Planned QC/QA activity
N/A: QC/QA activity not planned
Initial: Completed QC/QA activity initialed and dated
NP: QC/QA activity planned but not performed

☐ Scope Change: _____

(rev. November 4, 2011)

# GS Project Specific Quality Control Plan for Geotechnical Design Report Deliverables

Use this form for preparation of geotechnical design reports, such as GDR's and/or FR's. Refer to the *Quality Management Plan for Geotechnical Design* for directions on the usage of this form and for the minimum expectations for quality control for each of the QC/QA activities.

Date: _____ Initial Plan: ☐

Addendum: ☐ _____

## Project Information

District: _____ County: _____ Route: _____ PM: _____

EA: _____ Project ID: _____

Report Type (Circle One): GDR FR

Project Common Name: _____

Geoprofessional: _____ PSQC Complete: _____

Branch Chief: _____ PSQC Complete: _____

Office Chief: _____ PSQC Complete: _____

## QC/QA Activities

| | Geoprofessional | | Branch Chief | | |
|---|---|---|---|---|---|
| | **Planned** | **Completed** | **Planned** | **Completed** | |
| Review Request with Client | | | | | |
| Develop Work Plan | | | | | |
| Review of Archive Data | | | | | |
| Field Visit | | | | | |
| Field Investigation Peer Review | | | | | ☐ Helpful ☐ Not Helpful |
| Design and Constructability Peer Review | | | | | ☐ Helpful ☐ Not Helpful |
| Calculation Check | | | | | |
| Review Draft Report | | | | | |
| 3rd party Draft Final Report Review | | | | | |
| Issue Geotechnical Report | | | | | |
| | | | | | |
| | | | | | |

X: Planned QC/QA activity
N/A: QC/QA activity not planned
Initial: Completed QC/QA activity initialed and dated
NP: QC/QA activity planned but not performed

☐ Scope Change: _____

(rev. November 4, 2011)

**OFFICE OF DRILLING SERVICES**
**FUNCTIONAL QUALITY CONTROL PLAN**

**Drill Scheduling Receives Drilling Request & Schedules Project**

- Log project into Jobs Received Listing
- Notify PiRC/Party Chief/Geoprofessional and their respective Senior that Drilling Services has received their drilling project and will contact them ASAP

**Scheduling Senior Driller (SSD) reviews Drilling Request and Provides a Drilling Target Date to Client**

- SSD evaluates parameters of the drilling job and determines the necessary drilling equipment for the project
- Determines possible Drilling Target Date and communicates with Client
- Places the project on the Statewide Drilling Schedule

**Previewing Senior Driller Develops Preview Document**

- Schedules site preview with client to review job site
- Performs Site Preview - reviews accessibility, utility issues, USA markings, Traffic Control Plan requirements, Permits, and environmental constraints, etc.
- Documents parameters for the Leadworker

**Scheduling Senior Driller verifies complete Drilling Package**

- Complete Preview Document with parameters
- Verifies Site Safety Plan is complete
- Verifies Hazards Query is current
- Verifies Permits are current
- Verifies Environmental constraints are evaluated and permits current

**Senior Engineering Geologists perform Peer Reviews**

- Attend peer reviews and provide opinion on drilling plan

**Leadworker performs Pre-mobilization Contact Meeting**

- Before leaving for the field - Leadworker reviews with SSD and Client - Drill Request, Site Safety Plan, Hazards Query, Traffic Control Plan, and Hole Abandonment Plan.
- Verifies that copies of all Permits are in hand
- Understands the Environmental and accessibility constraints

**Leadworker & crew mobilize to the Job Site**

- Makes final arrangements with Client - arrival time, lane/shoulder closure times, sampling plan, brass or sampling supplies needed for client, estimated depth of hole, current USA number, weather conditions affecting jobsite, maintenance support, etc.
- Verifies copies of permits are on site – Railroad, Right to Enter, Right of Way, Environmental Permits, F&G permits, Army Corp of Engineer Permits
- Contacts Maintenance as necessary in reference to Traffic Control Plan

- Verify all crewmembers have proper PPE and safety gear available
- Verifies vehicles and drill rigs are Pre-op'd and ready for drilling before leaving terminal – verify PMs are up to date, checks with Drilling Equipment on equipment issues
- Obtain drilling supplies and verify with crew before leaving for the field
- Obtain appropriate motel accommodations for crewmembers

**Tailgate Safety Meeting**

- Leadworker requires Tailgate Safety Meeting before drilling commences

**Feedback During Drilling**

- Leadworker, SEG and SSD will communicate during the week to verify drilling job progress.
- SSD and SEG communicate with Party Chief/Client to verify progress

**De-mobilization**

- Perform hole abandonment as prescribed by Party Chief
- Perform jobsite cleanup
- Dispose of drill waste appropriately in barrels, appropriately marked and taken to nearest mud disposal staging area
- Verify with Party Chief that jobsite cleanup and hole abandonment are acceptable
- Communicate with SSD upon conclusion of the project to verify next week's project and where to stage Drill Rig and Tender
- Communicate equipment problems to Equipment Senior Driller
- Verify that all crewmembers are able to travel next week

SEGs within Drilling Services review Drill Logs with their Leadworkers
Contact PiRC/Party Chief and their respective Supervisors and evaluate the job and review Lessons Learned

# Office of Drilling Services Quality Control Plan

Date: _____

## Project Information

District: _____ County: _____ Route: _____

Proj ID: _____ Phase/Obj: _____

Project Common Name: _____

Geoprofessional: _____

Leadworker: _____

Senior Driller: _____

Supervisor: _____

Use this form for evaluating Drilling Projects. Refer to the *Quality Management Plan for Geotechnical Design* for directions on the usage of this form and for the minimum expectations for quality control for each of the QC/QA activities.

### QC/QA Activities

| | Supervisor | Senior Driller | Leadworker |
|---|---|---|---|
| Receive Drill Project & Schedule | | | |
| Perform Site Preview | | | |
| Complete Drill Package | | | |
| Verify Permits & Access | | | |
| Peer Review | | | |
| Pre-Mobilization Contact Meeting | | | |
| Mobilize to Site | | | |
| Feedback During Drilling | | | |
| De-Mobilization | | | |
| Perform Evaluation QC/QA | | | |

X: Planned QC/QA activity
N/A: QC/QA activity not planned
Initial: Completed QC/QA activity
NP: QC/QA activity planned but not performed

# Gamma-Gamma Logging Field Records
## Technician Instructions

Accurate record keeping is an essential aspect of field data collection. Foundation Testing Branch technicians provide not only the original data but the records needed to prove compliance with California Test Method 233.

**Daily Field Report**

- Fill out all project information at the top of the page at the *start of the day*.
- Document when work begins and any field safety meetings conducted / attended.
- Record the functionality test values. Show the 4 readings and the daily mean.
- Identify the piles and tubes that you are performing Gamma-Gamma Logging on while you are recording the data. Every time you start a new pile tube, add the pile to the list.
- Document any conversations with Structure Representative or Contractor personnel where information was given or direction received.
- Describe any significant observations of Contractor work.
- Record the time of when you leave the site and any overtime hours.
- All Field Report data must be filled out *concurrently*. You may *not* fill out Daily Field Reports at the end of the day. Log everything as it happens.
- Provide the white copy of the Daily Field Report to the FTB engineer.

**Set-Up Sheet**

- Fill out all of the project information
- Identify the Winch-Probe-Source and Standard Reference serial numbers.
- Note the Probe-Source calibration and verify that it is current
- Document the functionality information. Verify that the daily mean is between the LFL and UFL limits.
- Run the dummy probe through each tube and document depths.
- Record the file name of each tube.
- Document any significant occurrences during testing
- Provide the Set-Up sheet to the FTB Engineer

**Electronic Data**

- Prior to logging a tube, fill out all pertinent information in the logging program. Required information includes project name, pile and tube numbers and operator name.
- Immediately after completing each tube, open the LAS file and verify that the data is complete. Close the file. *Do not* save or modify the file.
- If the file is incomplete, corrupted or questionable, rerun the tube and note the need to do so on the setup sheet.
- After completion of testing for the day, copy all data to a USB drive.
- Submit the Data to the FTB engineer.

# Gamma-Gamma Logging (GGL) Checklist

## Data and Record Sheet

Testing Engineers shall complete this checklist prior to analysis for all piles that they analyze for Gamma-Gamma Logging. This process will provide a record of compliance with the documentation procedures contained in California Test Method 233 as well as verify the integrity and quality of data returned by technicians. The Testing Engineer must be familiar with CTM 233 to complete this sheet. Individual GGL Checklists shall be filled out for each day of field testing. Any "no" answer requires a written explanation and supervisor approval, or the data may not be used.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Test Date: _____
Support / Piles Tested: _____
_____

### Field Data

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Was the completed Daily Field Report provided? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does it identify piles tested on that day? |
| ☐ | ☐ | Does it contain hours worked on that day? |
| ☐ | ☐ | Was a functionality test performed that day? |

| | | | |
|---|---|---|---|
| 2 | ☐ | ☐ | Was the completed Gamma-Gamma Logging Setup sheet provided? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is the Probe-Source identified? |
| ☐ | ☐ | Does it note the Probe-Source calibration? |
| ☐ | ☐ | Is the calibration correct for the probe and current? |
| ☐ | ☐ | Is the Standard Reference identified? |
| ☐ | ☐ | Is functionality information documented? |
| ☐ | ☐ | Is the daily mean between the LFL and UFL limits? |

| | | | |
|---|---|---|---|
| 3 | ☐ | ☐ | Were .las and .rd data files provided for all tubes? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Are .rd and .las file pairs acceptably matched for date and time? |
| ☐ | ☐ | Are dates of data files consistent with the Setup Sheet? |
| ☐ | ☐ | Are dates of data files consistent with the Daily Field Report? |
| ☐ | ☐ | Do the times match the sequence in the Daily Field Report? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

# Gamma-Gamma Logging (GGL) Checklist

## Archive Verification Sheet

Testing engineers shall complete this checklist after a Gamma-Gamma Logging report is completed. This process will ensure that all vital GGL data is electronically documented and preserved. Any additional information not identified here must also be preserved. Any "no" answers require a written explanation and supervisor approval.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Report Date: _____
Support / Piles in Report: _____
_____
_____
_____

### Archive Data

Name of Project Folder on Archive: _____

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Has a subfolder been created for this report?<br>Name of subfolder: _____ |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does the subfolder contain a "Raw Data" folder? |
| ☐ | ☐ | Have all .las and .rd files been uploaded to that folder? |
| ☐ | ☐ | Have all .las and .rd files retained their original time stamps? |
| ☐ | ☐ | Does the subfolder contain a "Report" folder? |
| ☐ | ☐ | Has the scanned .pdf report file been uploaded? |
| ☐ | ☐ | Are all supporting components and spreadsheets uploaded? |
| ☐ | ☐ | Does the subfolder contain a "Documentation" folder? |
| ☐ | ☐ | Have scanned copies of the field data logs been uploaded? |
| ☐ | ☐ | Have scanned copies of the setup sheets been uploaded? |
| ☐ | ☐ | Have scanned copies of GGL Checklist Sheet 1 been uploaded? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

*After completion of Gamma-Gamma Logging Checklist Sheet 2, this document shall also be archived in the appropriate "Documentation" folder.*

# Crosshole Sonic Logging (GGL) Checklist

## Data and Record Sheet

Testing Engineers shall complete this checklist prior to analysis for all piles that they analyze for Crosshole Sonic Logging. This process will provide a record of compliance with the standards of this Office. Any "no" answer requires a written explanation and supervisor approval, or the data may not be used.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Test Date: _____
Support / Piles Tested: _____
_____

If Gamma-Gamma Logging has been performed on this pile, identify:
Report Title: _____ Date: _____

### Field Data

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Was the completed Daily Field Report provided? |
| | | | Yes ☐ No ☐ Does it identify piles tested on that day? |
| | | | Yes ☐ No ☐ Does it contain hours worked on that day? |
| 2 | ☐ | ☐ | Is the completed Crosshole Sonic Logging Data sheet present? |
| | | | Yes ☐ No ☐ Is the equipment utilized identified? |
| | | | Yes ☐ No ☐ Are all applicable dimensions recorded? |
| 3 | ☐ | ☐ | Were raw data files provided for all tubes? |
| | | | Yes ☐ No ☐ Are dates of data files consistent with the Data Sheet? |
| | | | Yes ☐ No ☐ Are dates of data files consistent with the Daily Field Report? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

# Crosshole Sonic Logging (CSL) Checklist

## Archive Verification Sheet

Testing engineers shall complete this checklist after a Crosshole Sonic Logging report is completed. This process will ensure that all vital CSL data is electronically documented and preserved. Any additional information not identified here must also be preserved. Any "no" answers require a written explanation and supervisor approval.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Report Date: _____
Support / Piles in Report: _____
_____
_____
_____

### Archive Data

Name of Project Folder on Archive: _____

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Has a subfolder been created for this report?<br>Name of subfolder: _____ |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does the subfolder contain a "Raw Data" folder? |
| ☐ | ☐ | Have all data files been uploaded to that folder? |
| ☐ | ☐ | Does the subfolder contain a "Report" folder? |
| ☐ | ☐ | Has the scanned .pdf report file been uploaded? |
| ☐ | ☐ | Does the subfolder contain a "Documentation" folder? |
| ☐ | ☐ | Have scanned copies of the daily field logs been uploaded? |
| ☐ | ☐ | Have scanned copies of the data sheets been uploaded? |
| ☐ | ☐ | Have scanned copies of CSL Checklist Sheet 1 been uploaded? |

2 For Crosshole Sonic Logging performed on piles that have received Gamma-Gamma Logging (GGL), the name of related GGL subfolder: _____

Testing Engineer:
Name: _____ Signature: _____ Date: _____

*After completion of Crosshole Sonic Logging Checklist Archive Verification Sheet, this document shall also be archived in the appropriate "Documentation" folder.*

# Pile Driving Analysis (PDA) Checklist

## Data and Record Sheet

Testing Engineers shall complete this checklist prior to analysis for all piles that they analyze for Pile Driving Analysis. This process will provide a record of compliance with the standards of this Office. Except as identified, any "no" answer requires a written explanation and supervisor approval, or the data may not be used.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Test Date: _____
Pile Tested: _____

| | Yes | No | |
|---|---|---|---|
| * | ☐ | ☐ | Was a Pile Load Test also performed on this pile? ("No" Answer does not require explanation.) |

If Pile Load Testing has been performed on this pile under the same report title, such as for Field Acceptance Criteria, a separate Pile Load Testing Checklist should be completed.

### Field Data

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Was the completed Daily Field Report provided for each day? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does it identify the day(s) the pile was tested? |
| ☐ | ☐ | Does it contain hours worked on that day? |

| | Yes | No | |
|---|---|---|---|
| 2 | ☐ | ☐ | Is the completed Pile Driving Analysis Data sheet present? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is the equipment utilized identified? |
| ☐ | ☐ | Are all applicable dimensions recorded? |

| | Yes | No | |
|---|---|---|---|
| 3 | ☐ | ☐ | Were raw data files provided for the test? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Are dates of data files consistent with the Daily Field Report? |
| ☐ | ☐ | Are the calibrations for all equipment current? |
| ☐ | ☐ | Were all significant and / or unusual testing events documented? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

# Pile Driving Analysis (PDA) Checklist

## Archive Verification Sheet

Testing engineers shall complete this checklist after a Pile Driving Analysis report is completed. This process will ensure that all vital PDA data is electronically documented and preserved. Any additional information not identified here must also be preserved. Any "no" answers require a written explanation and supervisor approval.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Report Date: _____
Support / Piles in Report: _____
_____
_____
_____

### Archive Data

Name of Project Folder on Archive: _____

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Has a subfolder been created for this report?<br>Name of subfolder: _____ |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does the subfolder contain a "Raw Data" folder? |
| ☐ | ☐ | Have all data files been uploaded to that folder? |
| ☐ | ☐ | Does the subfolder contain a "Report" folder? |
| ☐ | ☐ | Has the scanned .pdf report file been uploaded? |
| ☐ | ☐ | Does the subfolder contain a "Documentation" folder? |
| ☐ | ☐ | Have scanned copies of the daily field logs been uploaded? |
| ☐ | ☐ | Have scanned copies of the data sheets been uploaded? |
| ☐ | ☐ | Have scanned copies of PDA Checklist Sheet 1 been uploaded? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

*After completion of Pile Driving Analysis Checklist Archive Verification Sheet, this document shall also be archived in the appropriate "Documentation" folder.*

# Pile Load Testing (PLT) Checklist

## Data and Record Sheet

Testing Engineers shall complete this checklist prior to analysis for all piles that they analyze for Pile Load Testing. This process will provide a record of compliance with the standards of this Office. Except as identified, any "no" answer requires a written explanation and supervisor approval, or the data may not be used.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Test Date: _____
Pile Tested: _____

| | Yes | No | |
|---|---|---|---|
| * | ☐ | ☐ | Was dynamic Analysis also performed on this pile? ("No" Answer does not require explanation.) |

If Pile Dynamic Analysis has been performed on this pile under the same report title, such as for Field Acceptance Criteria, a separate Pile Dynamic Analysis Checklist should be completed.

### Field Data

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Was the completed Daily Field Report provided for each day? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does it identify the day the pile was tested? |
| ☐ | ☐ | Does it contain hours worked on that day? |

| | Yes | No | |
|---|---|---|---|
| 2 | ☐ | ☐ | Is the completed Pile Load Test Data sheet present? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Is the equipment utilized identified? |
| ☐ | ☐ | Are all applicable dimensions recorded? |

| | Yes | No | |
|---|---|---|---|
| 3 | ☐ | ☐ | Were raw data files provided for the test? |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Are dates of data files consistent with the Daily Field Report? |
| ☐ | ☐ | Was a backup deflection measurement used? Method: _____ |
| ☐ | ☐ | Was a backup load measurement method used? Method: _____ |
| ☐ | ☐ | Was data recorded contemporaneously by hand? |
| ☐ | ☐ | Were all significant and / or unusual testing events documented? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

# Pile Load Testing (PLT) Checklist

## Archive Verification Sheet

Testing engineers shall complete this checklist after a Pile Load Test report is completed. This process will ensure that all vital PLT data is electronically documented and preserved. Any additional information not identified here must also be preserved. Any "no" answers require a written explanation and supervisor approval.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Report Date: _____
Piles in Report: _____

### Archive Data

Name of Project Folder on Archive: _____

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Has a subfolder been created for this report?<br>Name of subfolder: _____ |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does the subfolder contain a "Raw Data" folder? |
| ☐ | ☐ | Have all data files been uploaded to that folder? |
| ☐ | ☐ | Does the subfolder contain a "Report" folder? |
| ☐ | ☐ | Has the scanned .pdf report file been uploaded? |
| ☐ | ☐ | Does the subfolder contain a "Documentation" folder? |
| ☐ | ☐ | Have scanned copies of the daily field logs been uploaded? |
| ☐ | ☐ | Have scanned copies of the data sheets been uploaded? |
| ☐ | ☐ | Have scanned copies of PLT Checklist Sheet 1 been uploaded? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

*After completion of Pile Load Testing Checklist Archive Verification Sheet, this document shall also be archived in the appropriate "Documentation" folder.*

# Pile Load Testing (PLT) Checklist

## Archive Verification Sheet

Testing engineers shall complete this checklist after a Pile Load Test report is completed. This process will ensure that all vital PLT data is electronically documented and preserved. Any additional information not identified here must also be preserved. Any "no" answers require a written explanation and supervisor approval.

### Project Information

Report Title: _____
Project / Bridge Name: _____
EA: _____ Bridge No.: _____ Report Date: _____
Piles in Report: _____

### Archive Data

Name of Project Folder on Archive: _____

| | Yes | No | |
|---|---|---|---|
| 1 | ☐ | ☐ | Has a subfolder been created for this report?<br>Name of subfolder: _____ |

| Yes | No | |
|---|---|---|
| ☐ | ☐ | Does the subfolder contain a "Raw Data" folder? |
| ☐ | ☐ | Have all data files been uploaded to that folder? |
| ☐ | ☐ | Does the subfolder contain a "Report" folder? |
| ☐ | ☐ | Has the scanned .pdf report file been uploaded? |
| ☐ | ☐ | Does the subfolder contain a "Documentation" folder? |
| ☐ | ☐ | Have scanned copies of the daily field logs been uploaded? |
| ☐ | ☐ | Have scanned copies of the data sheets been uploaded? |
| ☐ | ☐ | Have scanned copies of PLT Checklist Sheet 1 been uploaded? |

Testing Engineer:
Name: _____ Signature: _____ Date: _____

*After completion of Pile Load Testing Checklist Archive Verification Sheet, this document shall also be archived in the appropriate "Documentation" folder.*

## Quality Management Plan for Geotechnical Instrumentation Branch

This *Quality Management Plan* is to document the practice and the procedures required by the Geotechnical Instrumentation Branch (GIB) to assure its compliance with the GS Quality Management Program. GIB provides services on geotechnical instrumentation, in-situ testing, cone penetration test (CPT), and administrating Translab radiation safety. Geotechnical Design Offices within the Geotechnical Services are the primary clients of GIB; other offices within the department may request such services from time to time.

Geotechnical Instrumentation Monitoring Reports and Cone Penetration Test Reports are the primary deliverable of the GIB, and may be incorporated into Geotechnical Design Reports or Foundation Reports prepared by Geotechnical Design Offices. GIB provides geotechnical instrumentation monitoring and cone penetration testing services to its clients through all phases of the projects, especially in the preliminary, construction and post-construction phases of projects.

This *Quality Management Plan* documents the required quality control and quality assurance (QC/QA) activities used by the GIB to assure that quality products are delivered to its clients. It is expected that GIB staff to read, understand, execute, and implement their respective roles and responsibilities of this *Quality Management Plan* and the *GS Quality Management Program*.

## Overview

Documentation of QC/QA activities will utilize either the *GIB Project Specific Quality Control Plan (PSQC) for Field Instrumentation* or the *GIB Project Specific Quality Control Plan (PSQC) for Cone Penetration Test* for each deliverable being prepared. The PSQC Plans present a list of activities requiring oversight and documentation to assure that the projects are progressing appropriately and meeting acceptable standards and/or practice.

The PSQC Plans allow GIB staff to identify roles and expectations specific to their projects and to establish and track completion of the identified quality milestones. For all of the listed activities, it is expected that the Branch Chief provides appropriate level of supervision and/or oversight required to comply with the GS Quality Management Program and this *Quality Management Plan*.

Activities that are to be performed for the GIB QC/QA effort are listed below. Bulleted items within each activity are suggestions of things to do for each QC/QA item:

**Quality Assurance/Quality Control Activities:**

Review Request -

- GIB engineer communicates with the client to assure full understanding of the works requested;
- Review the request and evaluate if the type and quantity of the instrumentation / testing will serve the purpose intended;
- Establish testing schedule, monitoring frequency, and delivery date agreed by the client and GIB.

Field Data -

- Daily Field Report – Field staff document when work begins and any field safety meeting conducted, record field verification test values, describe any significant observations on site condition related to field instrumentation/testing; record when work ends, all field report data must be recorded concurrently, and provide the white copy of the Field Report to the GIB engineer;
- Field Record Sheet – record all setup information and its follow up monitoring / testing data as outlined in the Field Record Sheet;
- Raw data files – download and forward the raw data files to the GIB engineer, and cc GIB Branch Chief, without any modification.

Data Reduction/Reporting

- GIB engineer checks Daily Field Report, Field Record Sheet and Raw Data Files for time stamps, and consistency among these records;
- GIB QC engineer and Branch Chief review and approve reports;
- Final report submitted to the client once signed off by GIB engineer and QC engineer (or Branch Chief).

Archive Data (to GIB common drive)

- Archive raw data files;
- Archive signed final reports (in PDF format);
- Archive supporting documents pertaining to the project and the PSQC plan signed by GIB engineer and Branch Chief.

# Field Instrumentation Quality Control

**Project Information:**

Project Name:_____

District: _____ County:_____ Route:_____ Bridge No._____

EA:_____ Project ID:_____

**Instrumentation Type:**

☐ slope inclinometer(V, H) ☐ TDR ☐ piezometer ☐ water level Logger

☐ tiltmeter ☐ beam sensor ☐ extensometer ☐ settlement device

☐ others _____

**QC/QA Activities:**

| | Yes | No | Comments | Date |
|---|---|---|---|---|
| 1. Review Request | | | | |
| 2. Field Data | | | | |
| • Daily Field Report | | | | |
| • Field (Setup) Record sheet | | | | |
| • Raw data file downloaded | | | | |
| 3. Data Reduction/Reporting | | | | |
| 4. Archive Data | | | | |
| • Raw data (e-file) | | | | |
| • Report (pdf file) | | | | |
| • Documentation (e-file) | | | | |

Project Engineer
Name:_____, Signature:_____ Date:_____

Branch Chief
Name:_____, Signature:_____ Date:_____

# Cone Penetration Test Quality Control

**(ASTM D5778)**

**Project Information:**

Project Name:_____

District: _____ County:_____ Route:_____ Bridge No._____

EA:_____ Project ID:_____

**Types of Testing:**

☐ standard cone ☐ piezo cone ☐ seismic cone

☐ dissipation test ☐ others _____

**QC/QA Activities:**

| | Yes | No | Comments | Date |
|---|---|---|---|---|
| 1. Review Request | | | | |
| 2. Field Data | | | | |
| • Daily Field Report | | | | |
| • Field (Setup) Record sheet | | | | |
| • Raw data file downloaded | | | | |
| 3. Data Reduction/Reporting | | | | |
| 4. Archive Data | | | | |
| • Raw data (e-file) | | | | |
| • Report (pdf file) | | | | |
| • Documentation (e-file) | | | | |

Project Engineer
Name:_____, Signature:_____ Date:_____

Branch Chief
Name:_____, Signature:_____ Date:_____

## Quality Management Plan for Geophysics and Geology

This *Quality Management Plan* documents the procedures required to assure compliance with the GS Quality Management Program. The Geophysics and Geology Branch (GGB) provides field investigation services and internal consultation to the four Geotechnical Design Offices. In that capacity, the Geotechnical Design Offices are the primary client of the GGB, though the GGB may provide support services to other Offices or Divisions within the Department. Geophysical Reports are the primary deliverable product of the GGB and the findings of those reports are typically incorporated into a Geotechnical Design Report or Foundation Report prepared by the Geotechnical Design Offices.

The GGB can provide recommendations to its clients through all phases of a project. This *Quality Management Plan* documents the required quality control and quality assurance (QC/QA) activities used by the GGB to assure that quality products are delivered to our clients.

It is expected that GGB staff read, understand, execute, and implement their respective roles and responsibilities of the *GS Quality Management Program* and this *Quality Management Plan*.

### Overview

Documentation of QC/QA activities will occur using the *GGB Project Specific Quality Control Plan* (PSQC Database) for each deliverable. The PSQC Database presents a list of activities requiring oversight and documentation to assure that the project is progressing and meeting appropriate standards. Note that the PSQC Database lists a subset of the many work activities performed by the geoprofessional and it is expected that the Branch Chief will provide the oversight necessary to fulfill the *roles and responsibilities* of the GS QMP.

The PSQC Plan allows the geotechnical design team to proactively identify roles and expectations specific to their project and to establish and track completion of the additional quality milestones, if identified. For all of the listed activities it is expected that the Branch Chief provide the appropriate level of supervision and/or oversight required to comply with the GS QMP and this *Quality Management Plan*.

Expectations for each QC/QA Activity are presented below:

## QC/QA Activities

Receive Request

- Request is received from the client.
- Branch chief reviews request for feasibility.
- Branch chief may accept request, return request to client for amendment, or refuse request with justification.
- Accepted requests are logged into the GGB tracking database.

Develop Work Plan

*Client Consultation*

- Consult with the client to assure full understanding of the work request and to identify potential omissions in the scope of work requested.
- Discuss schedule and agree to a delivery date.
- Identify activities, personnel, schedule and priorities.
- As needed, identify and coordinate with other geotechnical work on the same project.

*Field Visit/Office Review*

- Assure that the appropriate inspections are made in accordance with the project needs. Not every project will require an initial field visit.
- Review relevant as-built plans, LOTB's and reports by searching BIRIS and the Geotechnical Archive (GeoDOG), and any other relevant records. These records will typically be provided by the client.

*Finalize Work Plan*

- Identify anticipated site conditions and contingencies affecting field work.
- Identify materials and personnel needed to complete field activities.

Field Investigation

- Perform field activities as identified in the work plan.
- At minimum, the client is required to be present on-site at the start of field.activities, to ensure proper location of field activities and adequacy of scope.
- The client is required to provide necessary utility and environmental clearances prior to start of field work, and coordinate with District personnel for any required lane closures and related support.
- Client acts as a liaison with the District for the duration of field activities.

*Review Changes to Work Plan*

- Changes to the work plan necessary due to unforeseen conditions are communicated to the branch chief and client.

*Preliminary Data Review*

- Data are checked by another geoprofessional to the extent necessary that the checker, geoprofessional and Branch Chief are confident that they are accurate.

Data Processing and Interpretation Review

- Check for adequacy of data processing efforts.
- Check for accuracy of data interpretation.

Review Draft Report

- Check for compliance with applicable reporting standards.
- Check for consistency with other reports, if any, for the same project.
- Check for implementation of informal peer review recommendations, if any.
- Check for readability, clarity, grammar, and spelling.

Issue Final Report

*Final Approval*

- Geoprofessional presents final report to branch chief for final review and approval. If geoprofessional is unlicensed, branch chief cosigns and stamps final.
- Branch Chief reviews the PSQC Database, resolves any outstanding issues, and finalizes entries into the PSQC Database in the GGB project archive.

*Distribute and Archive*

- Geoprofessional submits final report to client.
- Copies of final report are submitted to the GGB project archive.
- For clients outside of GS, copies of final report are also submitted to GEODOG.

This form serves as a template for information contained in an electronic database to be used in preparation of reports prepared by the Geophysics and Geology Branch. This form itself will not be used. Refer to the *Quality Management Plan for Geophysical Services* for directions on the usage of the database and for the minimum expectations for quality control for each of the QC/QA activities.

**Project Information**

District: _____ County: _____ Route: _____ PM: _____

Project Code: _____

Project Common Name: _____

Client: _____

Branch Chief: _____

**QC/QA Activities**

| Activity | Client | Geoprofessional | Branch Chief |
|---|---|---|---|
| Receive Request | | | |
| Log request to database | | | |
| Develop Work Plan | | | |
| Client Consultation | | | |
| Field Visit/ Office Review | | | |
| Finalize Work Plan | | | |
| Field Investigation | | | |
| Review changes to investigation plan | | | |
| Preliminary data review | | | |
| Data Processing and Interpretation Review | | | |
| Review Draft Report | | | |
| Issue Final Report | | | |
| Final approval | | | |
| Distribute & archive | | | |
| Comments | | | |

*Date for each completed QC/QA activity*
"NP": QC/QA activity planned but not completed
"NA": QC/QA activity not applicable

## Geotechnical Laboratory Functional Quality Control Plan

### Introduction

The purpose of this Quality Management Plan is to document the practices and procedures that are in place to ensure that the work performed and reports generated by the staff of the Geotechnical Laboratory are of consistently high quality in compliance with the GS Quality Management Program as well as AASHTO Materials Reference Laboratory (AMRL) Quality System Program. The Geotechnical Laboratory Branch (GLB) provides laboratory testing and internal consultation to the four Geotechnical Design Offices. In that capacity, the Geotechnical Design Offices are the primary client of the GLB, though the GLB may also provide laboratory testing services to other Offices or Divisions within the Department. Geotechnical Laboratory Reports are the primary deliverable product of the GLB and typically incorporated into a Geotechnical Design Report or Foundation Report prepared by Geotechnical Design Offices.

The GLB can provide geotechnical laboratory testing services to its clients through all phases of a project. The Quality Management Plan documents the required quality control and quality assurance (QC/QA) activities used by the GLB to assure that quality products are delivered to our clients.

It is expected that GLB staff read, understand, execute and implement their respective roles and responsibilities of the GS Quality Management Program and this Quality Management Plan.

### Overview

Documentation of QC/QA activities will occur using the GLB Project Specific Quality Control Plan (PSQC Plan) for each deliverable. The PSQC Plan presents a list of activities requiring oversight and documentation to assure that the project is progressing and meeting appropriate standards. Note that the PSQC Plan lists a subset of the many work activities performed by the geoprofessional and it is expected that the Branch Chief provide the oversight necessary to fulfill the roles and responsibilities of the GS QMP. The PSQC Plan allows the geotechnical design team to proactively identify roles and expectations specific to their project and to establish and track completion of the additional quality milestones, if identified. For all of the listed activities, it is expected that the Branch Chief provide the appropriate level of supervision and/or oversight required to comply with the GS Quality Management Plan.

Expectations for each QC/QA Activities are presented below:

### QC/QA Activities

### Work Request

*Receive and Check Request and Samples*

- Request including the forms and soil/rock samples is received from the client.
- Geoprofessional reviews the request information including the type and quantity of the lab tests requested and test condition.
- Checks the required request forms including a laboratory tracking form, sample boring records and a TL 101 form and their contents for accuracy. For tube and plastic bag samples and rock cores, only laboratory tracking form and sample boring record are required. However, for bulk soil samples tested for compaction, expansion index and corrosion, in addition to the two forms described above, a TL 101 form is also required. Because the bulk soil samples are required to be processed in the Grade Bench Unit of METS in compliance with AMRL requirements.
- Identify the irregularities and omissions of the form content, sample identification (ID), quantity and test conditions if there is/are and consult with the client for clarification, correction and modification.

*Log Request to GT Laboratory Data Management System (GLDMS)*

- Soil/rock samples are processed and tested in the order they are received except emergency project or requested by the client. A tracking number is assigned based on the order described above for each project received.
- The acceptable requests are logged into the Data Management System for tracking, processing and review the test data and results.

*Issue Completed Request*

- An electronic copy of the completed request forms indicating the type of test and its quantity and the estimated completion dates is issued to client via email for review and confirmation.
- Occasionally, minor modification may be required if the client has changes in the testing program, and the request form and/or sample boring records may need to be modified in the GT Data Management System accordingly.

**Work Assignment and Performance**

*Distribute work Assignments*

- One copy of the test assignment sheets (computer print-out of the sample boring records showing highlight on the assigned test and expected testing due date) is distributed to individual Geoprofessional.

- The Geoprofessional reviews the assigned test information on the assignment sheets and checks on the touch screen monitor of the GLDMS and prepares for testing.

*Perform Tests*

- All laboratory tests are performed on the samples and test conditions requested.
- For moisture, upon completion of testing the assignment sheets and work sheets are initialed, dated and submitted for reviewing and QC/QA checking.
- For index testing (MA, PI), upon completion of testing, Assistant Lab Manager will print out the preliminary test results to the geoprofessional for checking the data entries. Then, the work sheets, assignment sheets and preliminary test results are initialed, dated and submitted for reviewing and QC/QA checking
- For other engineering testing, upon completion of testing, the computer print-out of test results showing input and output data as well as the graphic presentation are checked by the geoprofessional for accuracy and then initialed, dated and submitted for reviewing and QC/QA checking.

*Review Test Results*

- Review and QC/QA will be conducted by Assistant Laboratory Manager/Branch Chief using the computer of GLDMS or the hard copy of computer print-out.
- If irregular, inconsistent and/or invalid test data are found, the tests will be rejected for correction.

**Final Report**

*Final Approval*

- A final report including test result summary, test data and graphic presentation is prepared by Assistant Laboratory Manager.
- An electronic copy of the final report in PDF format is submitted to Branch Chief for approval.

*Distribute & Archive*

- Upon approval, an electronic copy of the report is distributed to the client via email and GT electronic file.
- Original test assignment sheets, work sheets and report are filed in GT Laboratory Room 319A for five years and then boxed for long-term storage.

# GLB Project Specific Quality Control Plan

Geotechnical Laboratory Branch (GLB) uses this form for preparation of laboratory testing reports for any geotechnical lab testing project requested. The directions on the usage of this form and the minimum expectations for quality control for each of the QC/QA activities are referred to the Quality Management Plan for Geotechnical Laboratory Testing Services.

**Project Information**

Project Name: _____ Date _____

Dist – EA: _____ County: _____ Route: _____ PM: _____

Office: _____ Senior: _____ Engineer/Geologist: _____

**QC/QA Activities**

| Activities | Client | Geotechnical Staff | Branch Chief |
|---|---|---|---|
| Work Request | | | |
| Receive and Check Request and Samples | | | |
| Log Request to GLDMS | | | |
| Issue Completed Request | | | |
| Work Assignment and Performance | | | |
| Distribute Work Assignment | | | |
| Perform Test | | | |
| Review Test Results | | | |
| Final Report | | | |
| Final Approval | | | |
| Distribute & Archive | | | |
| Comments | | | |

**Notes:** Initial and date for each completed QC/QA activities
"NP" – QC/QA activity planned but not completed
"NA" – QC/QA activity not applicable
GLDMS – Geotechnical Laboratory Data Management System

# Log of Test Borings QC/QA (Engineering Graphics Unit)

Requests for LOTBs are submitted to the Engineering Graphics Unit (EGU) from the Geotechnical Design Offices to be completed within project P&Q and PS&E dates. These Offices work together and exchange information to ensure that project LOTBs are completed and delivered in a timely manner.

## EGU LOTB Activities

**Receive LOTB Request**

- Geoprofessional submits one LOTB request per Structure or roadway component (e.g., individual landslide, cutslope, settlement area etc.), signed by the unit functional supervisor, with relevant work material (boring logs, site plans, As-Builts, etc).
- EGU lead person reviews each request for compliance with needed information.
- Lead person sends request to GSSU and/or EGU Branch Chief for technical evaluation resulting in acceptance of the submittal or request for revision and resubmittal.
- Accepted requests are logged into the EGU in-house database.
- Lead person prioritizes work according to the PS&E and P&Q project dates.

**Develop Work Plan**

- Coordinate with the Geoprofessional on scheduled dates. Priorities may be changed due to emergencies, construction work, legal or other issues. Scheduling exceptions will be permitted only at the request of the Geotechnical Design Office Chief.
- Assign personnel and give directions on how to best conduct work.

**Draft preliminary LOTB plan sheet**

- Implement design CADD standards.
- Follow Soil and Rock Logging, Classification, and Presentation Manual
- Print any pertinent As-Built LOTB sheet from Structure Maintenance & Investigations BIRIS program, bridge files or GeoDog.
- Contact Geoprofessional for clarification of any questionable information or instruction.
- Produce LOTB Checkprints for internal review by the EGU Lead Person and/or Branch Chief.
- Produce LOTB Checkprints and deliver to client for review.

**Checkprint Review**

- Receive Checkprint with corrections made by the Geoprofessional.
- Amend all redlines and insert revision dates in the plan sheet.
- Print LOTB for review and revision (if necessary).
- Receive and correct final redlines.
- Insert revision dates.

- Repeat the above steps until the checkprint is returned with no required corrections
- Produce LOTB Quality Assurance Checkprint for review by client

**QualityReview**
- Receive Quality Assurance Checkprint and correct final redlines (if any).
- Insert revision dates.
- Produce LOTB Quality Assurance Checkprint for review and revision (if necessary) by client
- Repeat the above steps until the Quality Assurance Checkprint is returned with no required corrections.
- Receive signed QC/QA form
- Issue *Authorization for use of Electronic Signature* form to be filled and signed by the Geoprofessional.

**Finalizing**
- Receive *Authorization for use of Electronic Signature* forms.
- Insert licensed responsible Geoprofessional signature on LOTB plan sheets.
- Signature and date on LOTB plan sheets should be same as the one on the Authorization for use of Electronic Signature form.

**Submittal of final electronic LOTB files**
- Send finalized electronic LOTB copies and *Authorization for use of Electronic Signature* forms to Structure Project Engineer, Design Senior with cc to Geoprofessional and Functional Supervisor.
- Produce PDF files of completed LOTB for archiving.
- Note project finalization in EGU database.

# LOTB PROJECT QUALITY CONTROL PLAN

Date:_____

## Project Information

District-EA:_____ County:_____Rte:_____PM:_____

Structure Title:_____

Requestor:_____

Branch Functional Supervisor_____

## QC/QA Activities

| | Detailer | Geoprofessional | Checker | Branch Chief |
|---|---|---|---|---|
| Receive Request | | | | |
| Log request to database | | | | |
| Develop Work Plan | | | | |
| Draft preliminary LOTB | | | | |
| Review | | | | |
| Second Review | | | | |
| Finalizing | | | | |
| Submittal | | | | |

## Scour Quality Management Plan

I. DESCRIPTION

The specific purpose of this scope is to evaluate various bridges over tidal and non-tidal waterways with scourable beds to determine the risk of failure from scour.

II. OBJECTIVE

The Geotechnical Support Section of the Bridge Scour Critical Program provides geotechnical services for bridge scour evaluation on bridges within the various districts in the State of California.

III. PROVISIONS FOR WORK

The engineering geologist in the Bridge Scour Critical Program is a part of a team and works with multi-disciplined team of engineers to ensure proper evaluation of scour and its effects on bridges over waterways. District Engineers, Engineers from the Division of Maintenance in Bridge Hydraulics/Hydrology, Rating Engineers, Structure Engineers, work together to come to a consensus on potential bridge scour associated problems and possible corrective actions. The key individuals within the team having direct oversight of this work collectively discuss the project and reach a consensus regarding the final decision with the scope of the problem and needed services. The evaluation performed in four (1) Data Collection and Qualitative Analysis, (2) Hydrologic and Hydraulic Assessment, (3) Geotechnical and Structural Scour Assessment, and (4) Recommend Plan of Action, depending on the requested information.

The role of the geotechnical branch primarily is to provide consultation on the site specific geology, scourability, and the geotechnical conditions that may exist. The majority of the communicating results are based on verbal discussions with the hydraulic engineers, either during the regularly scheduled Peer Review sessions, joint field review of the site, telephone conversations, or emails responses. However, a summary report also may result where detailed analyses are required and tabulated data are needed for reviews and distributions. A Peer Review of the site includes all the stakeholders in which a Plan of Action (POA) is prepared and finalized.

IV. SERVICES

The scope service provides the information to be used for scour assessment, and the methods and procedures to be followed in performing scour evaluations for existing waterway bridges in the Bridge Scour Critical Program. The scope document is not all-inclusive; the geotechnical evaluation must use good judgment in its application to ensure that the evaluation is complete and appropriate for a

specified site or conditions. Ingenuity in applying concepts and procedures is an integral part of the recommendations.

## V. Methodology

The geotechnical recommendations and analyses use general procedures of calculations and guidelines specified in the Geotechnical services, and reviews Hydraulic guidelines from the Maintenance Hydraulics, but may vary from the general methodology and specific requirements presented in these guidelines, as required. A helpful tool is the familiarity with the FHWA Technical Advisory 5140.23 used for policy guidelines in scour evaluation, the FHWA HEC-18 used for detailed scour analysis process for river environment, and the FHWA HEC-20 used for stream stability analysis. HEC-18 methodology is the main manual utilized by the Hydraulics. For geotechnical analysis, the National Highway Institute Manuals are primarily used in the geotechnical evaluations such as Drilled Shaft Construction Procedures and Design Methods, Design and Construction of Driven Pile Foundation, Load and Resistance Factor Design of Substructures, Alternative Pile Systems, Soils and Foundations Workshops, and Drilled Shafts. Other methods, literatures, and experiments may be used when appropriate for a specified scour conditions.

### DATA COLLECTION AND QUALITATIVE ANALYSIS

The site and data analysis for this phase is qualitative and of the simplest form. It involves reviews of request as received, preliminary conclusions and findings based on the application of simple evaluation of data and site conditions.

There may be some instances where sufficient information is found and conditions are such that a scour assessment and bridge stability recommendation can be made at this level. Note: These steps are similar to those found in FHWA HEC-20.

1. PERFORM AN OFFICE DATA SEARCH AND COLLECTION OF INFORMATION PERTINENT TO THE STRUCTURE. WHEN AVAILABLE, THIS DATA SHALL INCLUDE:
    i. Construction and as-built plans;
    ii. Bridge inspection reports (BIRIS);
    iii. Hydraulic & hydrologic data and Cross-Sections provided by the Office of Hydraulics and Hydrology;
    iv. The current typical channel and flood plain cross-section beyond the area affected by the bridge crossing in accordance with bridge inspection;
    v. Foundation reports, test boring data, site geology, subsurface information in Archived files and BIRIS;
    vi. Other Agency Studies such as Soil Conservation Service

(SCS), United States Geological Survey (USGS), etc.;
vii. Review of geology and geologic maps by California Geologic Survey (CGS);
viii. Aerial photography when Available;

2. CONDUCT A FIELD RECONNAISSANCE (NOT A FORMAL SURVEY) TO SUPPLEMENT EXISTING DATA FOUND DURING THE OFFICE INVESTIGATION. COLLECT INFORMATION SUCH AS:

i. Sufficient topographic and elevation data to develop or supplement plan profile drawings of site;
ii. Probe where practicable to obtain or confirm structure foundation , depth, elevations, etc;
iii. Observe and record channel and floodplain characteristics at as well as up and down stream of the crossing
iv. Describe the observed geological conditions at the site including their influence on stream stability;
v. Record any indications of scour in the area of the bridge;
vi. Describe bed and bank materials;
vii. Plot hydrographic survey (bridge channel cross-section) as required;
viii. Investigate and note any up or downstream activities, such as sand and gravel mining, reservoirs, or channel improvements, that would influence short or long term channel stability;
ix. Note any major changes or anticipated changes in the watershed over the life of the structure;
x. Obtain information on flood history of the site (including local resident interviews where practical);
xi. Drift conditions and potential;
xii. Observe other general geomorphic features of the stream reach;
xiii. Note any levees, dikes, or other stream controls;
xiv. Note stream confluences;
xv. Record site and special stream factors with photographs.

3. COMMUNICATION OF GEOTECHNICAL & FOUNDATION SCOUR ASSESSMENT AND QUALITATIVE/QUANATATIVE SUMMARY (AS REQUIRED):

i. Requested data or information based on the research conducted for the scour.
ii. Analyze potential scour depth and extent, including consideration of the foundation material's resistance to scour.
iii. Analyze capacity of each foundation unit for loads and structural stability under scour conditions.
iv. Evaluate load capacities when appropriate or requested.
v. For bridges found to be scour critical, scour susceptible, and/or with unknown foundations, establish recommendations for

alternative plan(s) of action (POA).

vi. Prepare and present summary, when requested for capacity of each foundation unit, conclusions and recommendations.



**DEPARTMENT OF TRANSPORTATION**
**DIVISION OF ENGINEERING SERVICES**
**GEOTECHNICAL SERVICES – MS 5**
**OFFICE OF GEOTECHNICAL SUPPORT**
**BRIDGE SCOUR CRITICAL PROGRAM**

## GS Project Specific Quality Control for Scour Critical Program

**Date:**

**File:**
**Bridge Name**:
**Bridge No.**:

**Geoprofessional:** **PSQC Completed:**

**Office Chief:** **PSQC Completed:**

## QC/QA Activities

| | Senior Engineering Geologist | Office Chief | |
|---|---|---|---|
| **Review request with client** | | | |
| **Review Archive Data** | | | |
| **Field Visit** | | | |
| **Calculation Check** | | | |
| **Review Draft Report** | | | |

X: Planned QC/QA activity
N/A: QC/QA activity not planned
I: Initial – Completed QC/QA activity
NP: QC/QA Activity Planned but not performed

# Independent Quality Assurance

## Under Development